USGS

Sound Waves Coastal Science and Research News from Across the USGS

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Fieldwork

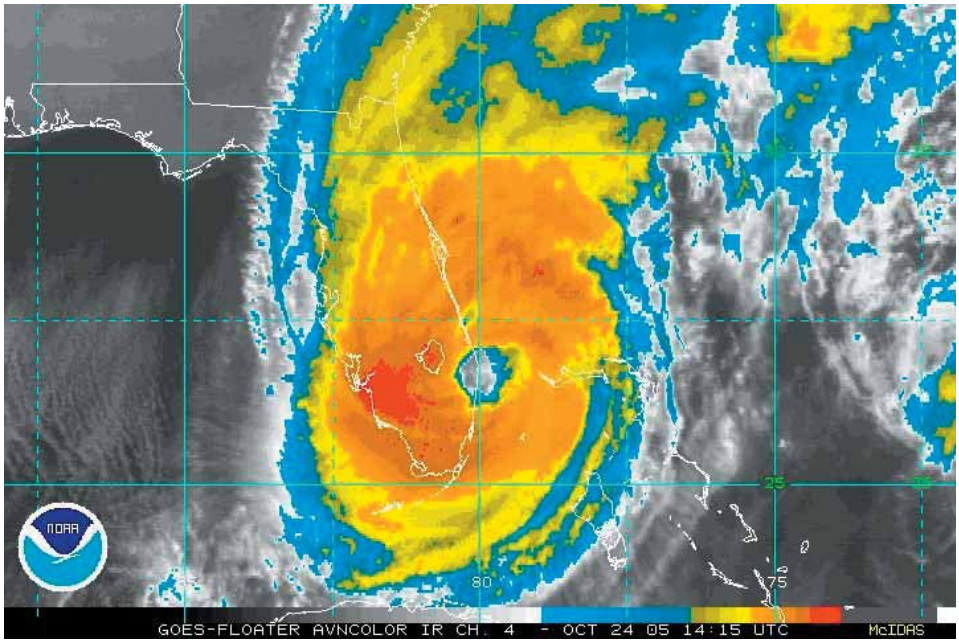
Monitoring Hurricane Wilma's Storm Surge

By Michael Byrne

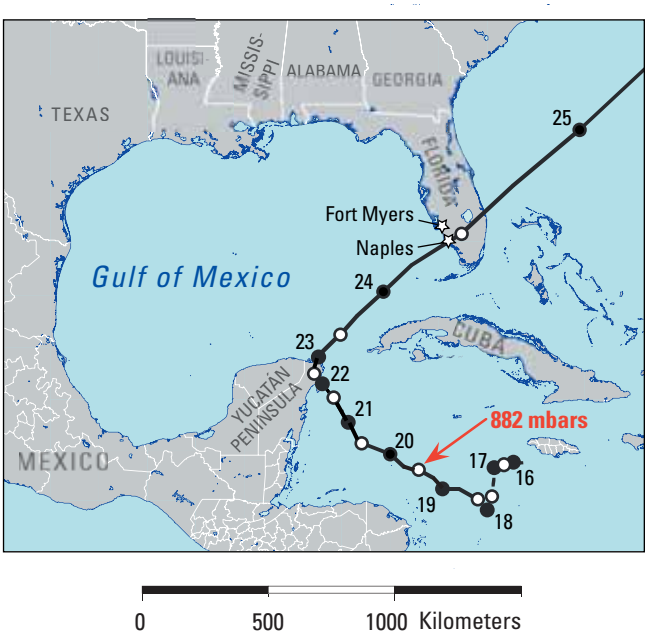
Residents in the Southeastern United States were still reeling from Hurricanes Katrina and Rita when Hurricane Wilma came on the scene, the third category 5 storm of the Atlantic hurricane season and, at its peak, the most intense tropical cyclone ever recorded in the Atlantic Basin (on the basis of its low central pressure). By the time Hurricane Wilma struck southwestern Florida on the morning of October 24, 2005 (then a category 3 storm), the U.S. Geological Survey (USGS) had established 30 temporary hydrologic stations to measure storm surge along the coast where the hurricane was projected to make landfall. Two days before Wilma hit, USGS teams from Louisiana (Ruston) and Florida (Tampa, Fort Lauderdale, and Fort Myers) coordinated their efforts to install the temporary gages at strategic locations. Even though the measured storm surge was not as high as predicted, the damage was still widespread. This monitoring effort is one example of how the USGS can provide important scientific information in a crisis.

Hurricane Wilma broke numerous records in what was arguably "the most devastating hurricane season the country has experienced in modern times," according to retired Navy Vice Admiral **Conrad C. Lautenbacher**, Undersecretary of Commerce for Oceans and Atmosphere and the National Oceanic and Atmospheric Administration (NOAA) Administrator. Wilma marked the first time that three category 5 storms occurred in one Atlantic hurricane season, and it reached category 5 intensity at a record rate: over the course of just 24 hours, from October 18 into October 19, Wilma strengthened from a 70-mph tropical storm to a 170-mph category 5 hurricane, unprecedented for an Atlantic tropical cyclone. At its peak on October 19, the

(Monitoring Wilma continued on page 2)



Satellite image showing Hurricane Wilma centered over southeastern Florida on the morning of October 24, 2005 (National Oceanic and Atmospheric Administration, 2005).



*Part of Wilma's path. Solid dots mark approximate positions of Wilma's eye at midnight UTC (Coordinated Universal Time) on the dates beside the dots (all dates in October 2005). Circles mark approximate position of Wilma's eye at noon UTC. (Local time, Eastern Daylight Time, was 4 hours earlier than UTC.) At approximately noon UTC on October 19, Wilma's minimum central pressure was 882 mbars, the lowest ever recorded for an Atlantic hurricane. (Modified from a map in a National Hurricane Center Tropical Cyclone Report on Wilma, which can be downloaded from URL **http://www.weather.gov/storms/wilma/**.)*

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Deadline: The deadline for news items and publication lists for the April 2006 issue of *Sound Waves* is Friday, March 10.
Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.
Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator© files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

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Fieldwork, continued

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hurricane's sustained wind speed was about 185 mph and its minimum central pressure was estimated at 882 mbars, a record low for a hurricane in the Atlantic Basin.

Wilma weakened slightly, to a category 4 storm, before hitting Mexico's Yucatán Peninsula late on October 21. There it stalled for a day, dumping more than 5 ft of rain in some areas and causing severe damage. Wilma's intensity was reduced by its passage over land, but as the storm moved into the Gulf of Mexico and approached Florida, it re-intensified to category 3, with maximum sustained winds of 115 mph and hurricane-force winds extending outward 85 mi from the center (see NOAA's Hurricane Wilma advisory 35, 11:00 p.m. EDT, Oct. 23, at URL **http://www.nhc.noaa.gov/archive/2005/pub/al242005.public.035.shtml**). A storm surge of 9 to 17 ft above normal tide levels was predicted for Florida's southwest coast and areas south of the projected storm path. The actual storm surge was determined to be about 3 ft, but this estimate may be revised as more data become available for analysis.

Personnel in the USGS offices in Louisiana and Florida recognized the potential for measuring the storm surge from this impressive hurricane. A team from Ruston, La., was quickly dispatched to Fort Myers, Fla., with pressure transducers for measuring water height and monitoring stands to hold each transducer at a constant elevation during the storm. The goal was to establish 30 temporary gaging stations along Florida's southwest coast where landfall was expected. The Fort Myers office lent personnel who designed the monitoring network and assisted with installation and removal of the stations. The Tampa, Fla., office lent personnel to assist in the site installation, and the Fort Lauderdale, Fla., office assisted in coordinating the effort.

Although damage from the hurricane was widespread, impact from the storm surge seemed minimal, with wind and rain causing most of the damage. Florida's southwest coast was mostly spared because the storm struck a sparsely populated area; however, Florida's east coast fared much worse because the storm hit heavily populated parts of Miami-Dade, Broward, and Palm Beach Counties.

Posthurricane storm-surge assessment is currently underway. Tasks that still need to be completed include (1) surveying the 30

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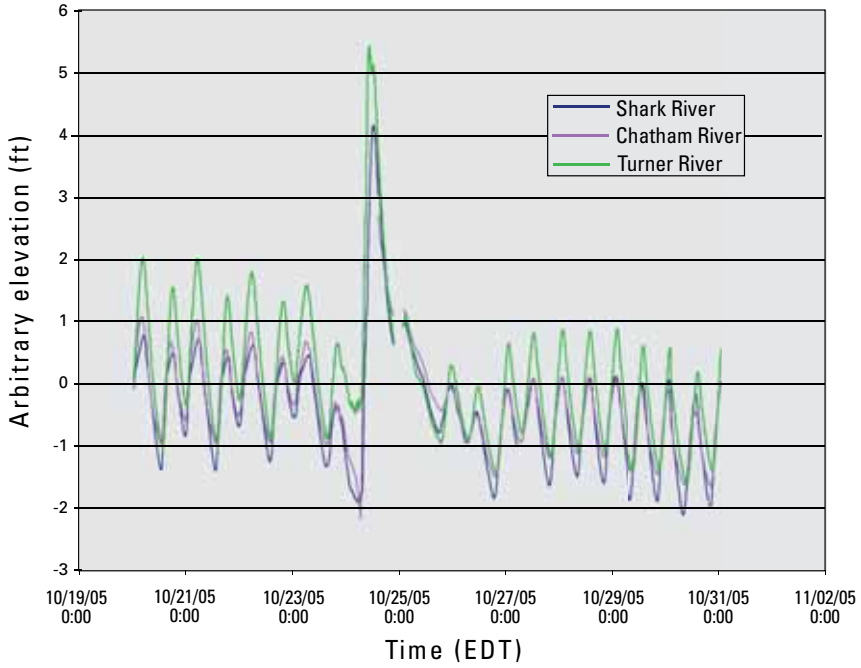
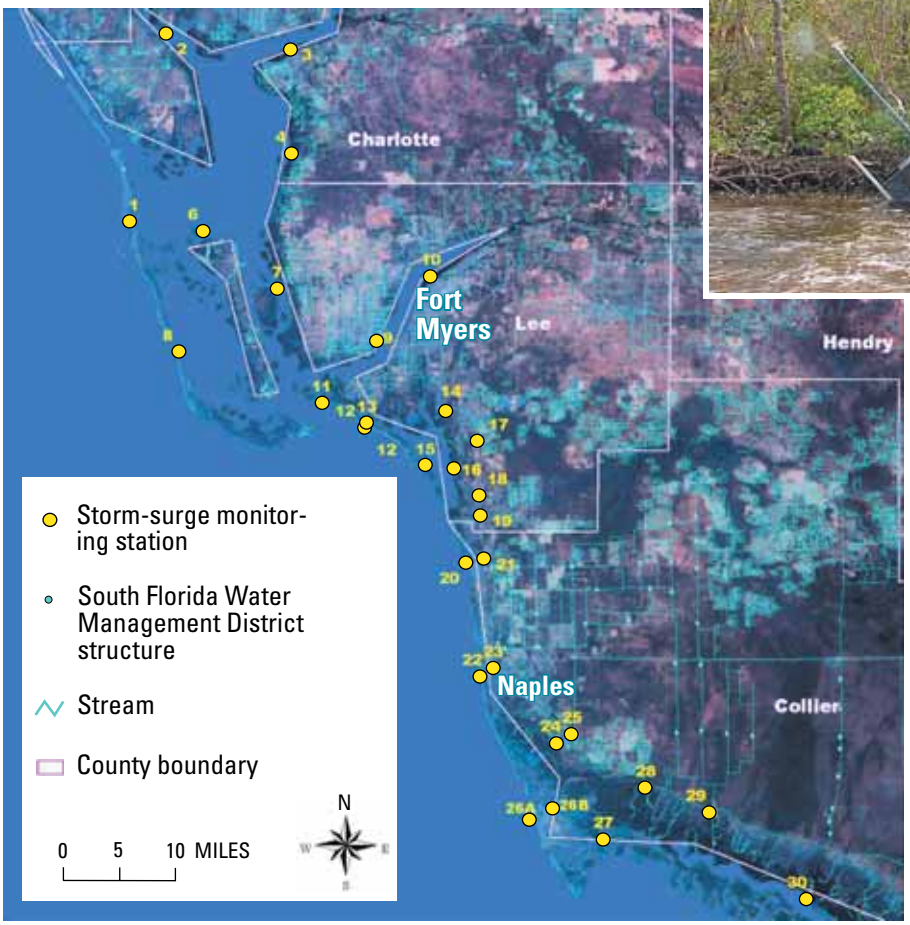


Graph showing relative changes in river elevations on the southwest coast of Florida, as measured by permanent coastal gages located south of the path of Hurricane Wilma and south of the temporary monitoring network. (Vertical axis is labeled "Arbitrary" because the gages have not been surveyed, and so their elevations have not yet been established.)



Map of temporary storm-surge-monitoring stations along the southwest coast of Florida.

Long-term tidal-monitoring gage at Lostmans River in Everglades National Park (southeast of study area) destroyed by Hurricane Wilma.

(Monitoring Wilma continued from page 2)

monitoring sites to determine their elevations relative to a "local datum," a plane of equal elevation with which all the measured water heights can be compared; (2) quality-assuring the data; and (3) generating a storm-surge map tied to the local datum. The results of this effort demonstrate how effective and efficient the USGS can be when a crisis is at hand, and they manifest the need for a national plan for rapid deployment of storm-surge instrumentation.

Thanks to all of the USGS personnel who put in long days to make this monitoring effort possible, including **Ben McGee** and **Burl Goree** (Ruston, La.), **Kevin Hubbs** and **Ray Dupuis** (Tampa, Fla.), **Gene Krupp**, **Sara Hammermeister**, **Lars Soderqvist**, **Craig Thompson**, **Jessica Flanigin**, and **Eduardo Patino** (Fort Myers, Fla.), and **Scott Prinos** (Fort Lauderdale, Fla.).

Abalones May Owe Their Huge Size to Sea Otters

By Robert Sanders, University of California, Berkeley

Abalone divers, who typically despise the California sea otter because of its voracious appetite for the largest and tastiest of the shellfish, may actually have sea otters to thank for the dinner-plate size of the prized delicacy.

Worldwide, abalones tend to be small, in the range of 2 to 4 inches across. Along the California and Pacific Northwest coast, however, abalones have grown much bigger, culminating in the 12-inch-diameter red abalone, *Haliotis rufescens*, avidly sought by divers and once the center of a thriving commercial fishery.

A surge in the 20th century in the sea-otter population killed off the commercial abalone industry along the central and southern California coast and made it hard for sport divers to find any abalones, let alone large, 12-inch ones. Many divers, fishermen, and even wildlife biologists worry that the sea otter is driving the abalone to extinction.

A new study of the interaction between abalones and California's coastal kelp forests, however, suggests that the sea otter played a key role in driving up the size of the abalones. Unlike kelp and algae in tropical waters, kelp in cold waters, like those along the California coast, have not developed toxic chemicals to ward off

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*Sea otters prey on herbivores that live off the drifting, dead kelp abundant along the Pacific coast. Photograph by **Chris Brown**, USGS.*

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voracious grazers, such as sea urchins and snails. As a result, abalones, which live off the drifting, dead kelp so abundant along the Pacific coast, thrive and grow huge on the highly nutritious food.

The researchers speculate that the sea otter helped set up this state of affairs. By ruthlessly preying on sea urchins and smaller snails, otters kept the herbivores at bay, and the kelp had no need to develop chemical deterrents. Abalones could, for the most part, hide from otters in rock crevices while gorging like couch potatoes on the tasty kelp washed up on their doorstep.

Research ecologist **James A. Estes**, a U.S. Geological Survey (USGS) scientist and adjunct professor at the University of California, Santa Cruz; evolutionary biologist **David Lindberg**, professor and chair of integrative biology at the University of California, Berkeley; and molecular geneticist **Charlie Wray**, Associate Administrative Director of the Mount Desert Island Biological Laboratory in Salisbury Cove, Maine, have published the results of their study in the journal *Paleobiology* (v. 31, no. 4, p. 591-606; to view the abstract online, go to URL **http://www.paleosoc.org/paleobio.htm**, click "OnLine Access," and navigate to volume 31).

"We realized with this study that most abalones are small, averaging 2 inches across, and live on coral reefs in the tropical Indopacific," **Lindberg** said. "So why does the world's largest abalone live in the same place as this major predator, the sea otter? We think the abundance of kelp, the ability of abalones to stay hidden in crevices, and the predation of otters set up an ideal system to ratchet up the size of abalones."

"There is very little doubt that in the old days, before people were part of the system and when otters were abundant along this coast, anywhere abalones occurred, the otters had a very limiting effect on their distribution and abundance," said **Estes**. "I think what was really going on was a dynamic equilibrium, where the populations in the crevices built up and the abalone would be pushed out to the point where otters could get them on the edges of the crevice. There were still lots of them there, but there was still a fair production that was being exploited by sea otters as well."

A 40-mm (1.5 in.) tropical abalone, Haliotis glabra*, is dwarfed inside the shell of the world's biggest, the cold-water Pacific species* Haliotis rufescens*, the prized red abalone. Photograph by* ***David Lindberg****.*

Lindberg has always been puzzled by claims that the sea otters are driving the abalones to extinction, since it is known that sea otters and abalones have shared coastal waters for the past 5 million years. The newcomers to the area, he said, are humans. Middens or refuse piles along the coast show that, historically, the California Indians also loved abalone and were the first to deplete the abalone population along segments of the coast.

"Since we can demonstrate that the large size increase took place in the presence of otters, the only hypothesis left as to the cause of the demise of a lot of abalone stock is human overfishing and probably destruction by humans of habitat," **Lindberg** said. "Getting an evolutionary grasp on a system gives us power in understanding its ecology and physiology, even if you are talking about management of wildlife stocks."

Colleagues for more than 20 years, **Lindberg** and **Estes** had often talked about the interactions along the coast between sea otters, abalones, and the abalone's principal food, kelp. **Lindberg**, a malacologist and former director of UC Berkeley's Museum of Paleontology, specializes in the evolution of mollusks. **Estes**, who has studied otters for some 35 years, has had a long-standing interest in the history of the kelp forests off the California coast. The two teamed up with **Wray**, a molecular geneticist, to look at the evolution of abalone size and how abalones may have affected the evolution of kelp.

Estes earlier had suggested that, as the Earth began to cool 45 million years ago, kelp moved out of their tropical homes into cooler waters in temperate regions of the Northern and Southern Hemispheres. The first radiation was into southern oceans 42 million years ago, as the Antarctic ice sheet developed, followed much later, possibly 10 million years ago, by radiation into the northern oceans as the Arctic froze over.

The current study, in which **Wray** used DNA comparisons to determine the family tree of abalones, supports these dates. Abalones, which originated about the time the dinosaurs died out 65 million

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years ago, moved into temperate areas around the same time as the kelp. Possibly because the kelp left behind many of the grazers that keep tropical kelp and macroalgae down, the temperate, cold-water kelp never developed the toxic chemicals that are typical of tropical kelp, and so abalones were able to grow large on the abundant food.

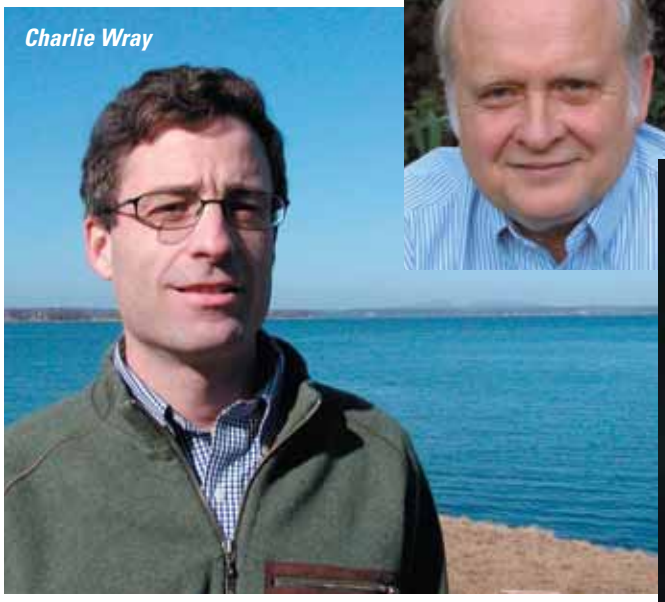
"In tropical systems, abalones are little-bitty things. But wherever one looks around the world where there are kelp-forest systems in cold oceans, that's where the bigger abalones occur," said **Estes**. "One of our major conclusions is that this has happened relatively recently in evolutionary time, starting around 5 million years ago."

Of eight abalone species now living along the Pacific coast from Baja California to British Columbia, six—the red, black, pink, white, green, and flat—are all 7 inches across or larger. Several species off the Japanese coast and in Antarctic waters also are significantly bigger than tropical species, which have remained small.

Interestingly, tropical kelp and algae have developed such toxic tissues that abalones no longer feed on them but, instead, have turned nocturnal and feed on blue-green algae and diatoms that form a scum on reef surfaces. Over time, kelp from the north has even returned to southern waters, yet abalones still avoid it as if it contained the same toxins as the original tropical kelp.

To both **Lindberg** and **Estes**, the California sea otter stood out as an intriguing member of the kelp/abalone community. Fossil evidence shows that otters have long lived along the coast and eaten the biggest and best of the abalone. Otters today take stones and pound on the underwater abalones until the shell margins break, then pry the abalones off the rocks with their paws, or they break the shells with a rock and come back later to peel the weakened abalones off the rocks. Although, in some situations, predators can drive prey to become larger to better fight off attacks, in the case of abalones, getting bigger just made them more attractive as a food source.

"If size is not a refuge, why would you get big, especially where you have a convenient predator taking you out at the same time?" **Lindberg** asked.



Charlie Wray

David Lindberg

Jim Estes

Hence the researchers' speculation that abalones grew large, in part, because of sea otters. The system lost its balance in the 1700s, when Russians first began slaughtering otters and fur seals for their pelts. By the time sea-otter and seal harvesting was outlawed in the early 1900s, the sea otter was thought to be extinct. Abalone populations rose, and abalones moved into more open spots, even developing a more peaked shell, since they no longer needed a slim shell to hide in crevices.

"We got a taste for abalone in the absence of otters, and now that the otter has come back, we're blaming the otter as a threat to the abalone," **Lindberg** said.

A remnant population of otters off Big Sur eventually grew to populate the entire central California coast, although it has yet to move south in numbers to the Channel Islands, or north beyond San Francisco. Divers fear that the California abalone sport fishery is doomed if otters do move toward the Mendocino coast.

"If otters spread into northern California, which is entirely a sport fishery now, a recreational fishery, a free diving activity—you can't exploit them using scuba, just breath-hold free diving—it will be pretty much over," **Estes** said.

The good news is that sharks may be keeping sea otters from spreading that far north, **Estes** said. He noted, too, that killer whales seem to have decimated sea-otter populations along Alaska's Aleutian Island chain.

Lindberg said that the abalone/sea-otter conflict is one of several unforeseen consequences of the Marine Mammal Protection Act, which was signed in 1972 and has led to a rapid rise in sea-mammal populations off the California coast. Seabird-nesting areas are being impacted by a burgeoning sea-elephant population, while sharks drawn by the mammals increasingly are attacking humans.

"We make management decisions all the time without an evolutionary perspective on how the system assembled over time," **Lindberg** said. "An evolutionary perspective is critical for understanding ecological context."

This work was funded in part by the National Science Foundation and the USGS. ❁

About the author: *Article author* ***Robert Sanders*** *holds degrees from Cornell University (B.S., engineering physics) and UC Berkeley (M.S., physics), attended the UC Berkeley School of Journalism, and has worked as a science writer at both UC Berkeley and UC San Francisco.*

"Into the Eye: Hurricanes"—Exhibit at the Pier Aquarium in St. Petersburg, Fla., Features USGS Science

By Ann B. Tihansky

While the 2005 hurricane season continued to set new records, the Pier Aquarium in St. Petersburg, Fla., unveiled a new hurricane exhibit highlighting U.S. Geological Survey (USGS) science. The St. Petersburg Pier Aquarium collaborated with the USGS and the National Oceanic and Atmospheric Administration (NOAA) to design and create an educational exhibit that would bring the science of hurricanes to the general public. The USGS took the lead in coordinating the effort of developing the exhibit, titled "Into the Eye: Hurricanes."

USGS hydrologist **Ann Tihansky** worked with Pier Aquarium project manager **Kristy Ultimo** and NOAA's **Michael Henderson** to determine the scope and content of the exhibit. **Ultimo** wanted an exhibit that would raise public awareness about the science behind understanding hurricanes. "The press does a really good job showing the destruction, but we want to give people an understanding about what actually causes the destruction, how we measure hurricanes as they develop, and the physical changes that take place in our coastlines as they pass," said **Ultimo**.

Michael Henderson, NOAA's regional coordinator for Tampa Bay, said: "NOAA is glad to be working with the USGS and the Pier Aquarium on this exhibit. We are especially glad to help in educating the public about hurricanes in general, but we're also proud of the collaboration among our partners in the Tampa Bay area."

"Into the Eye: Hurricanes" examines several basic categories of hurricane science:

- global-climate features that influence hurricane development,
- the inner workings, or "anatomy," of a hurricane,
- coastal hazards and responses to hurricanes, and
- the latest technology used to collect information that enables the forecasting of coastal vulnerability and change.

The exhibit relies primarily on graphics rather than text. Once the group agreed on scientific content, the challenges were to (1) decide which of all the excellent graphic images to use and (2) ensure that the text was both succinct and accurate. A dramatic NOAA satellite image of Hurricane Frances was used for the large (6 by 8 ft) title panel. USGS science support staff **Betsy Boynton** and **Laurinda Travers** created colorful, eye-catching graphics that illustrate many complex concepts. The exhibit also runs a loop of three USGS videos highlighting hurricane science and coastal impacts: *Hurricane Force*, *Exploring Storm Surge*, and *Anatomy of a Hurricane*.

Howard Rutherford, executive director of the Pier Aquarium, was pleased to see local science reach

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*Partners in scientific education, USGS and NOAA contributed their latest scientific findings to the hurricane exhibit. Left to right, **Michael Henderson**, NOAA's regional coordinator for Tampa Bay; contributing USGS scientist **Abby Sallenger**; and **Shawn Bennett**, NOAA's meteorologist-in-charge at the National Weather Service Forecast Office in Tampa Bay.*

Three USGS video programs about hurricanes run a continuous loop as part of the "Into the Eye: Hurricanes" exhibit.

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the general public. "More than 1.5 million people visit the Pier annually, providing a large audience for our facility. We wanted a hurricane exhibit that would be unique and would highlight science being done in our backyard. Both the USGS and NOAA are located here in the Tampa Bay area, and we wanted to provide an opportunity to highlight their work. We've worked with both groups before and knew they could make hurricane-related science exciting and relevant. The nice thing about this exhibit is that it has been created in such a way that we can update panels and keep it current. While we were working on it, we kept reminiscing about the furor of 2004; then the 2005 season kind of blew that all away. We were also able to complement this exhibit with an educational hurricane poster created in partnership with the Florida Center for Ocean Sciences Education Excellence [COSEE-FL] and the SouthEast U.S. Atlantic Coastal Ocean Observing System [SEACOOS]."

Tucked into the Pier Aquarium among tanks and interactive displays, the hurricane exhibit has been a focus for school field trips and a backdrop for hurricane-related press interviews, and it was visited by USGS scientists attending a Gulf Coast science workshop held at the Pier in January 2006.

*USGS personnel **Terry Edgar**, **Betsy Boynton**, and **Laurinda Travers** (left to right) discuss the importance of effective illustrations in conveying scientific concepts to the general public.*

Scientific Leader and Researcher Terry Edgar Retires

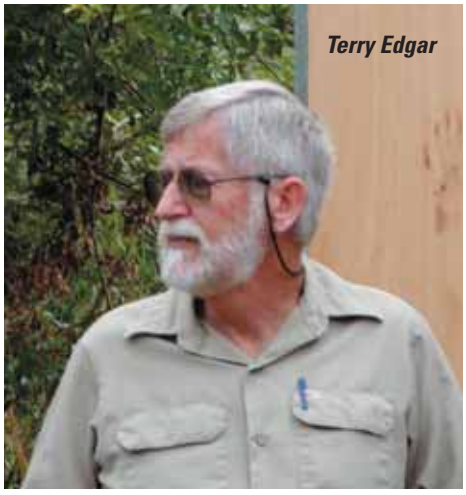
By Dick Poore and Jack Kindinger

Geologist **Terry Edgar** is retiring from the U.S. Geological Survey (USGS) after 30 years as a leader in the agency's coastal and marine geology program.

Terry received his Ph.D. in 1968 from Columbia University. His early research focused on characterizing the structure and distribution of oceanic sediment and the Earth's upper crust with seismic reflection and refraction surveys. **Terry** published the first comprehensive study of the acoustic properties and thickness of sediment in the Pacific Ocean, which demonstrated that the crust of the Pacific Basin is progressively older from east to west.

Terry became a scientific leader early in his career. When the Deep Sea Drilling Project (DSDP) was being formulated in the late 1960s, **Terry** was instrumental in setting the scientific priorities and plans for this important and high-visibility effort in the Earth sciences. While he was still a graduate student, **Terry** prepared the proposal that outlined the scientific objectives and drilling sites for the initial DSDP legs in the Atlantic Ocean. His proposal was used as a model for choosing the initial DSDP cruises and sites in the Pacific Ocean. **Terry** joined DSDP in 1968 as a staff scientist. He was co-chief scientist for the first DSDP cruise across the Atlantic and soon became chief scientist of the entire program. **Terry** guided the program through its formative years and laid the foundation for management and structure of DSDP and it successor, the Ocean Drilling Program (ODP).

In 1975, the USGS hired **Terry** to develop and lead its programs in marine geology. As Chief of the Office of Marine Geology, **Terry** was responsible for directing programs involving the resource potential, environmental setting, and over-



Terry Edgar

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all geologic framework of the Atlantic, Pacific, and Alaskan continental margins and adjacent deep-water areas. In addition to his leadership in formulating and conducting scientific programs, **Terry** played a major role in providing advice to the Departments of the Interior and State with regard to offshore-international-boundary issues and offshore-resource policy.

In 1983, **Terry** stepped down as Chief of the Office of Marine Geology and returned to research. His first major effort was in the Caribbean, where he planned and implemented a study of the region's geology and tectonics. The project advanced our understanding of the complex plate margins and tectonics of the Caribbean region and provided an extensive side-scan-sonar survey of the Cayman Trough. After completion of the Caribbean project, **Terry** developed a major multidisciplinary project to explore the interaction of tectonics, eustasy, and climate on the morphology and characteristics of sedimentary deposits. The Predictive Stratigraphic Analyses project focused on sedimentary deposits across a climatic gradient that extended from the Appalachian Mountains to Death Valley. The principles developed in North America were then applied to understanding sedimentary sequences and associated mineral and energy resources in Southeast Asia.

Terry revisited management assignments for several years—serving as the Regional Program Scientist and then as Acting Chief of what is now the Center for Coastal and Watershed Studies in St. Petersburg, Fla.—until he quickly regained his senses and returned to research. His current official work is divided between a wetlands-coring and surface-sediment effort within the Tampa Bay Estuary project and the assessment of natural and anthropogenic variations in mercury in lake sediment along a transect from Florida to New England.

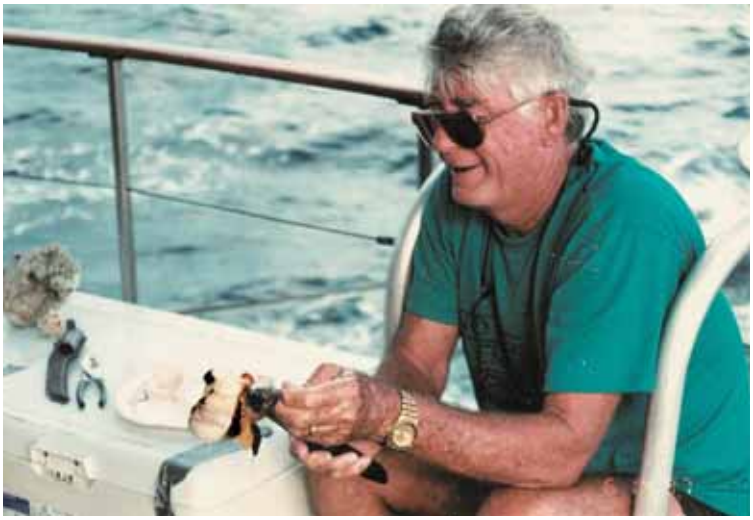
It is fitting that much of **Terry's** unofficial work over the last few years has involved developing an interdisciplinary and multinational science plan to sample and analyze sediment from the Gulf of Carpentaria (on Australia's north coast) to the Gulf of Thailand as part of the new Integrated Ocean Drilling Program (IODP), a large multinational program that is the grandson of DSDP (see "Proposal for Drilling in the Broad, Shallow Seas of Southeast Asia and Australia" in *Sound Waves*, September 2002, at URL **http://soundwaves.usgs.gov/2002/09/research.html**). Many of the principles and procedures employed by IODP were pioneered by **Terry** and his colleagues when they developed DSDP from an idea into a functioning and highly successful program. So, at the end of his career, **Terry** has come back to the beginning.

Terry's contributions, leadership, and dedication to the USGS and the field of marine geology are well recognized and exemplify an outstanding career. We wish him well! ❁

Retirement of Gene Shinn, Pioneer in Carbonate Sedimentology and Coral-Reef Ecosystems

By Bob Halley and Jack Kindinger

It's the end of an era: after 31 years, **Gene Shinn** has decided to retire from the U.S. Geological Survey (USGS), where he has conducted pioneering scientific research on carbonate sediments and coral-reef ecosystems.



***Gene Shinn** prepares a conch for dinner while explaining to a group of geologists (outside photograph) how to tell male conchs from female conchs.*

Gene came to the USGS after a distinguished career at Shell Oil and, in 1974, established the Fisher Island Field Station, Miami Beach, Fla. During his years at the field station, **Gene** won a USGS award for developing a hydraulic drilling device, and he published extensively on coral-reef ecosystems and modern and ancient carbonate sediments. **Gene's** groundbreaking research on carbonates showed that widespread submarine lithification is occurring on the sea floor in the Persian Gulf, producing features that previously were believed to form only during subaerial exposure. As a participant in the Pacific Enewetak Atoll Crater Exploration (PEACE) project in Enewetak, Marshall Islands, **Gene** made submersible and scuba dives to help determine the size, morphology, and deformation depth of two submarine craters created by hydrogen-bomb testing in the 1950s—a multifaceted study the USGS conducted at the request of the Defense Nuclear Agency. **Gene** was a co-discoverer of modern giant submarine stromatolites (similar to the dominant fossils of the Precambrian) that are forming in the Exuma Islands, Bahamas, reported in the November 1986 issue of Nature (v. 324,

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no. 6092, p. 55-58; see URL **http://www.nature.com/nature/journal/v324/n6092/abs/324055a0.html**). This exciting discovery helped change the way that geologists interpret the environments in which ancient stromatolites formed.

In 1989, when he moved to what is now the USGS Center for Coastal and Watershed Studies in St. Petersburg, Fla., **Gene** was working on a project that explored the effects of offshore drilling on ecosystems—a topic as timely today as it was then. Ever the pioneer in exploring environmental issues, **Gene** also led a project from 1991 to 1994 that helped determine the pathways and movement of sewage-contaminated ground water in the Florida coral-reef tract. These data have been used widely and are the basis for several court cases and environmental hearings. Later, **Gene** continued to work on ground-water-seepage rates and flow direction in Florida Bay and the Florida Keys. Recently, most people know **Gene** for his research and theories on the effects of African dust on coral-reef ecosystems. Once again the pioneer, **Gene** hypothesized, and led a research group to demonstrate, that dust coming from Africa contains viable microbes that could potentially harm various species and ecosystems. His research even spawned a fictional novel by **Sarah Andrews** entitled *Killer Dust* (see article in *Sound Waves*, April 2003, at URL **http://soundwaves.usgs.gov/2003/04/staff2.html**).

Gene's scientific impact spreads far and wide. Numerous scientists and lay people alike know him, have seen him on TV, have talked to him on the phone, or have e-mailed him. Why? Because **Gene** has always been a great communicator on all levels. He has been an American Association of Petroleum Geologists (AAPG) Distinguished Lecturer and has received three "best paper" and "outstanding paper" awards from major journals and national meetings. He won the 2002 USGS Shoemaker Award for Distinguished Achievement in Communications (see URL **http://internal.usgs.gov/OUTREACH/shoemaker/a_winners.html#2002**).

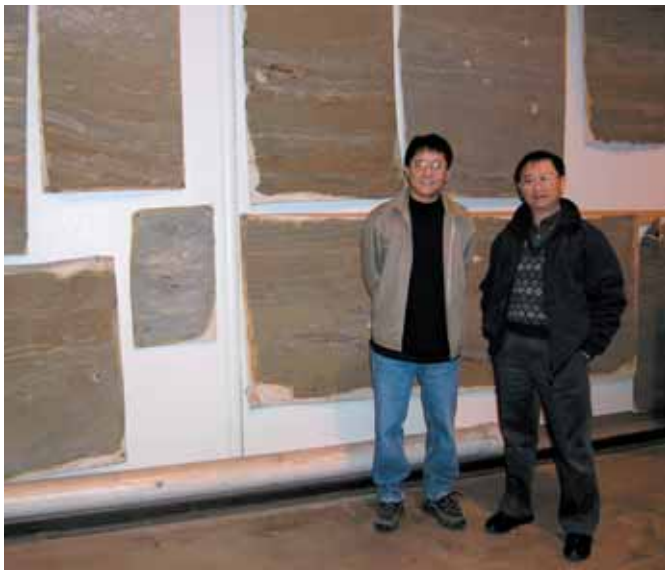
Gene has led field courses for geologists since the 1950s. Carefully elucidating how to observe carbonate-producing organisms, their accumulated sediment, and their interpretations in ancient rocks, he has tutored three generations of aspiring sedimentologists. It is not unusual for students to greet **Gene** with the remark that "My father/mother says your field trip in 19xx was one of the best experiences of his/her life!"

Eugene Shinn's extraordinary contributions to our understanding of carbonate sedimentology and coral-reef ecosystems were recognized in 1991 by the Meritorious Service Award of the Department of the Interior, in 1998 by Honorary Membership in the Society for Sedimentary Geology, and in 1998 by an Honorary Doctoral Degree bestowed by the University of South Florida. Though "retired" (not!), **Gene** remains dedicated to pursuing his scientific interests as a Courtesy Professor at the University of South Florida, College of Marine Sciences. We wish **Gene** all the best; you may contact him at **eshinn@marine.usf.edu**.

Taiwanese Scientists Visit the Western Coastal and Marine Geology Team

By Jingping Xu

Professor **James T. Liu** of National Sun Yat-sen University in Kaoshiung, Taiwan, and his chief technician, **Francy Kuo**, visited the U.S. Geological Survey (USGS)'s Western Coastal and Marine Geology (WCMG) Team in Menlo Park and Santa Cruz, Calif., December 19-21, 2005. The main purpose of the visit was to meet with team scientist **Jingping Xu** to discuss general collaborations in submarine-canyon studies, in particular a plan to employ USGS sediment traps and other mooring technology in Taiwan's Fate of Terrestrial Substances in Kao-ping Submarine Canyon (FATES-KP) research program. **Dr. Liu** and **Mr. Kuo** visited WCMG's Marine Facility (Marfac) in Redwood City, Calif., where **Jingping** and **Hal Williams** hosted a mock-up demonstration of sediment-trap use in tautline mooring and platform applications. At the USGS Pacific Science Center in Santa Cruz, **Dr. Liu** presented a seminar titled "Fate of Terrestrial Substances in Kao-ping Submarine Canyon (FATES-KP): Overview of an Interdisciplinary Research Program in Taiwan." **Jingping** and the Taiwanese delegation also visited **Charlie Paull** of the Monterey Bay Aquarium Research Institute (MBARI) in Moss Landing, Calif., who showcased MBARI's canyon-research programs in a guided tour.



*USGS oceanographer **Jingping Xu** (left) and visiting scientist **James Liu** at the USGS Marine Facility in Redwood City, Calif. Sediment peels adorn the wall behind them.*

Western Coastal and Marine Geology Team Welcomes Oceanographer Andrew Stevens

By Guy Gelfenbaum

Andrew Stevens has accepted a position as an oceanographer with the U.S. Geological Survey (USGS)'s Western Coastal and Marine Geology Team (WCMG), where he will be working with **Guy Gelfenbaum**.

Andrew received a B.S. in oceanography from Humboldt State University in 2002 and an M.S. in oceanography from Oregon State University in 2004. For his M.S. thesis, **Andrew** worked as part of the USGS EuroSTRATAFORM project, investigating along-margin changes in sediment erodibility in the Adriatic Sea (see related articles in *Sound Waves*, April 2003 and December 2002/January 2003). **Andrew** also participated in the team's recent project off the Palos Verdes shelf in southern California to study the fate of contaminated sediment in the region. After receiving his M.S. degree, **Andrew** spent a year at the U.S. Environmental Protection Agency in Newport, Oreg., developing acoustic methods for quantifying seagrass habitat.

At the USGS, **Andrew** will be working primarily on collecting and analyzing data collected as part of the Coastal Habitats in Puget Sound project. He is also currently examining data from several tripods deployed at the mouth of the Columbia River to validate modeling studies of wave-current interaction being carried out by visiting scientist **Giles Lesser**. **Andrew's** research interests include sediment-transport processes and products, estuarine and nearshore ecology, and acoustic characterization of coastal habitats.

Andrew's office is Room 1213 in Menlo Park, Calif., and his phone number is 650-329-5243. Please come by and welcome **Andrew** to the USGS. ❁

Andrew Stevens

Are Artificial Night Lights Among Threats to Declining Reptiles?

By Robert N. Fisher, Gad Perry, and Gloria Maender

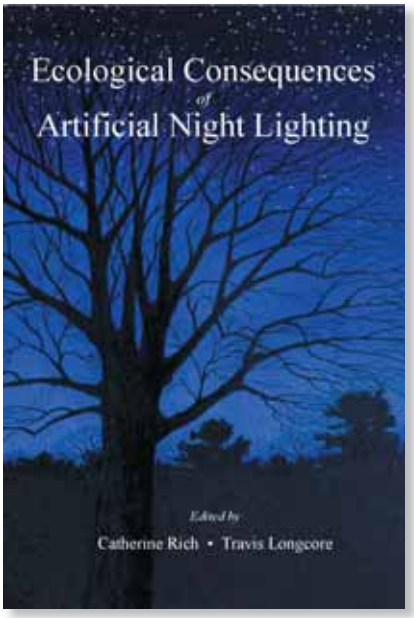
Lights enable humans to use the outside environment at night, but what does artificial illumination mean to wildlife? Artificial night lighting may affect the behavior of wildlife in complex ways and may even contribute to declines in some reptile species, according to a study by the U.S. Geological Survey (USGS) and Texas Tech University published as a chapter in a new book by Island Press. In the book, experts worldwide explore the ecological effects of artificial night lighting across animal groups and plants.

In their book chapter, **Robert N. Fisher**, a USGS scientist in San Diego, Calif., and **Gad Perry**, an assistant professor at Texas Tech University in Lubbock, reviewed the knowledge base from published and unpublished accounts and reported that scientists know relatively little about the effects of night lighting on reptiles, other than young sea turtles. They noted that little is known about the natural history of most herpetofauna (reptiles and amphibians), although decline rates in reptiles are believed by some scientists to be similar to those reported in amphibians.

In rapidly urbanizing southern California, **Perry** and **Fisher** noted that declines appear to be occurring in populations of many local reptile species from various causes, but significant local declines of two nocturnal snakes—from coastal sand dunes and marine terraces—may have links to light pollution.

"Significant range reductions in California glossy snake and western long-nosed snake closely track the regions with increased light pollution, based on comparisons with historical distributions," said **Fisher**. "Declines in these species haven't

(Artificial Night Lighting continued on page 11)



Cover of the recently published book. Photograph courtesy of Island Press.

(Artificial Night Lighting continued from page 10)

been recorded for similar rural habitats in northern California where light pollution has not yet become an issue."

Furthermore, in coastal southern California, the Pacific pocket mouse, a small nocturnal mammal that is the main prey for the California glossy snake, appears to have undergone a concurrent decline, indicating that both prey and predator may be adversely affected by light pollution, said **Fisher**.

One of the research goals **Perry** and **Fisher** consider a high priority is to understand the specific negative consequences of diffuse illumination—that is, not direct light but the brightness associated with lights from a distance—on reptiles, especially in urban and suburban areas.

Although many nocturnal reptiles, such as the California glossy snake and the western long-nosed snake, may be adversely affected by artificial night light, other species clearly take advantage of artificial light sources for the bountiful food they attract, **Fisher** and **Perry** said. For example, several kinds of geckos make their living catching insects around buildings. Some geckos are introduced species that readily become established around humans, and their increased predation affects invertebrate populations, such as moths—which are plant pollinators—that are attracted to lights. **Fisher** and **Perry** ask, what are the effects of seemingly benign introductions, such as house geckos, on other vertebrate and invertebrate groups, and to what extent do artificial night lights aid introduced species to become established and invasive?

Perry and **Fisher's** study is one of 17 chapters of the multiauthored volume—entitled *Ecological Consequences of Artificial Night Lighting*—which was edited by **Catherine Rich** and **Travis Longcore** and funded in part by the USGS. For more information about the book, visit URL **http://www.islandpress.org/books/detail.html/SKU/1-55963-129-5.**❁

*California glossy snake (*Arizona elegans occidentalis*). Photograph by **Chris Brown**, USGS.*

*Western long-nosed snake (*Rhinocheilus lecontei*). Photograph by **Chris Brown**, USGS.*

*Pacific pocket mouse (*Perognathus longimembris pacificus*) Photograph by **Cheryl S. Brehme**, USGS.*

*Array of drift fences and pitfall traps to monitor snakes near Tijuana River Estuary. Photograph by **Chris Brown**, USGS.*

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